A BOTTOM TRAWL SURVEY FOR CRABS IN THE SOUTHERN, KAMISHAK AND BARREN ISLANDS DISTRICTS OF THE COOK INLET MANAGEMENT AREA, JUNE 12 - JULY 6, 1994.

by
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INTRODUCTION

The department has been conducting trawl surveys for red king (Paralithodes camtschaticus) and Tanner (Chionoecetes bairdi) crabs in the Cook Inlet Management Area since 1990. The data from these surveys are used in part to generate crab population estimates. The population estimates in turn are utilized to set the quotas for the commercial fisheries.

The trawl survey replaced the pot index that was employed by the department prior to 1990 to assess the crab stocks. The pot survey data were used to establish an index of abundance which was subsequently related to commercial catch information. The shortcomings of the pot survey, such as soak variation, dependence on the commercial fishery, and the relative nature of the indices themselves, induced the Department to employ a trawl survey that would eliminate the influence of these variables and allow direct stock enumeration.

Historically trawl surveys have been operated by both the National Marine Fisheries Service (NMFS) in the Bering Sea and the Department of Fish and Game (ADF&G) in the Westward Region. Data from these surveys have proven satisfactory in determining stock conditions and resultant fisheries management strategies for king and Tanner crabs.

Many species of groundfish are captured during the trawl survey. Enumerating the catch had been inconsistent for the first few years of the survey due to personnel limits. Beginning in 1993 the regional groundfish biologist has regularly participated in the trawl survey therefore providing a vehicle for groundfish data collection and analysis which are documented in another report series.

OBJECTIVES

The 1994 survey goals were:

1. Determine abundance of Tanner and red king crab stocks in the Southern, Kamishak and Barren Islands Districts of the Cook Inlet Management Area (Figure 1).

2. Document the size and shell age of all Tanner, king and Dungeness (Cancer magister) crabs captured. Determine egg condition of all female crabs.

3. Documentation, including age, size and weight, of key groundfish species such as Pacific Cod (Gadus macrocephalus), pollock (Theragra chalcogramma), all rockfish species (Sebastes spp.) and sablefish (Anoplopoma fimbria). These data are reported in a separate data report series.

METHODS

Trawl and Area Description

The state research vessel Pandalus, overall length 66 feet, was utilized to conduct the survey. A 400 mesh eastern trawl was fished with 800 pound, 5'x 7', Nor'Eastern Astoria V trawl doors. Headrope and footrope lengths were 70 and 95 feet, respectively. The estimated fishing height and width were 9 and 40 feet, respectively. The trawl had 4.0 inch mesh in the wings and body, 3.5 inch in the intermediate and cod end, and a 1.25 inch cod end liner.

Selection of the general survey areas was based on historical pot indices, commercial catch information and preceding trawl survey results. Geographic areas that had a very limited probability of crab catch were not selected. The two general locations chosen were: 1) that portion of the Southern District from upper Kachemak Bay extending west to 152 degrees W. longitude, and 2) the Kamishak and Barren Islands Districts (referred to as Kamishak District) as far east as 152 degrees 40 minutes W. longitude (Figure 2).

Sampling Methods

Actual station sizes were initially based on those dimensions utilized in the Westward Region. Bay stations (Southern District) were 2.5 nautical miles square (6.25 sq. m.) (Figure 3) and ocean stations (Kamishak and Barren Islands) were 5.0 nautical miles square (25.0 sq. m.) (Figure 4). Station size and shape varied somewhat based on irregular coastline and depth. Depths shallower than 10 fathoms were always precluded from station selection. Bay stations were further stratified by depth to isolate the deep water (between 50 and 90 fathoms) which essentially runs from Gull Island to Barabara Point. Furthermore, individual station dimensions were re-evaluated annually, occasionally resulting in an increase or decrease in size. These re-evaluations were based on previous surveys and commercial fishery data.

Initial goals for tow length and time were 1.0 nautical miles and 30 minutes, respectively. If irregular bottom or hangups caused reduction in trawl duration, data from tow lengths of 0.5 nautical miles or greater were used. The data from shorter tows were discarded and the tows repeated. The trawl path was randomly selected within the station grid by the vessel skipper wherever it appeared that a good tow could be made. All tows were made during daylight hours.

Successful tows were brought aboard and weighed. All male king, Tanner and Dungeness crabs were weighed and measured. All female kings crabs were sampled; however, a one basket subsample of female Tanners and Dungeness was taken when the catches of these animals were large. Width measurements were used for Tanner and Dungeness crabs while length was utilized for king crabs. Shell age and egg condition information was recorded.

Finfish catches, including Pacific cod, pollock, sablefish and rockfish, were sampled by the Regional Groundfish Biologist. These data will be described in a separate Regional Information Report.

Data Analysis

Abundance estimates for king and Tanner crabs in each district were generated using the following area swept equation:

T = 151.9 (A) (C) where 151.9 is a factor to convert catch per nautical mile towed to catch per square nautical mile. (151.9 x 40 [fishing width of the net] = 6,076 feet [one nautical mile]).

T = the estimated total number for each species.
A = the area of the station in square nautical miles.
C = the catch per tow in number of crabs.

These data were calculated for each station which in turn were summed to yield an estimate for the district.

RESULTS

General

A total of 37 good tows were made from June 13 through July 6, 1994. Only one tow was shortened due to a net hangup. The number of stations fished in the Southern and Kamishak/Barren Islands Districts were 20 and 17, respectively. Total catches of all species and debris were 51,863 pounds in the Southern District and 31,039 pounds in the Kamishak/Barren Islands Districts (Appendices A and B).

Bottom temperatures taken from a recording device attached to the headrope of the trawl are reported for both districts in Appendix C.

Southern District

Crab catches for the Southern District were 1,711 pounds of Tanners, 98 pounds of king crabs and 189 pounds of Dungeness. The total catch of all other species and debris was 49,865 pounds (Table 1). The largest tow was estimated at 13,000 pounds and was comprised almost exclusively of pollock.

A total of 1,346 male Tanner crabs were caught. The majority (81%) were sublegals (<140 mm). Crabs smaller than 70 mm constituted the largest group of males captured (31%). True prerecruit ones and twos comprised 10 and 12 percent, respectively, of all the males caught. True prerecruits and recruits are new shells in the respective size classes. The legal male catch was 19 percent (257) of all age classes combined. True recruits constituted 35 percent of the legal male catch (Table 2 and Figure 5). The average width of the legal males was 156 mm (6.10 inches).

A total of 1,367 female Tanner crabs were caught. Of these, 854 (62%) were juveniles and the remaining 513 were adults. Of the adult females, 475 (93%) had full clutches. Only seven adults were barren and they were all very old shells. Of the adult females, 127 (25%) were newly mature (Table 3 and Figure 6). All eggs were uneyed.

Eleven male king crabs were caught. King crabs were caught in 5 of the 20 stations towed. Legal animals accounted for 7 of the 11 males. Postrecruits made up the entire legal segment of the catch. Four juveniles were captured (Table 4).

Ten female king crabs were caught in the Southern District and they all came from a single station. Four were adults and six were juveniles. All were new shelled. None of the adult females were barren. Two of the four adults had full clutches (Table 5). All eggs were uneyed.

Only 37 male Dungeness crabs were captured. The average width was 167 mm and sizes ranged from 131 to 187 mm (Figure 7). Legals accounted for 25 (68%) of the males. Of the 25 legals, 13 (52%) were true recruits. Of the 10 prerecruit ones, 7 were new shells and 3 were skipmolts. The remaining two sublegals were prerecruit twos (Table 6). Only one of the males was in a soft shell condition.

The female Dungeness catch numbered 114 animals. The average width was 145 mm and sizes ranged from 128 to 166 mm (Figure 8). Of the 114 females, 43 (38%) were new shells and the remainder were skipmolts. No females were bearing eggs (Table 7). No identifiable juveniles were captured; they could not be identified because there are no external indicators of sexual maturity other than the presence of eggs: even the obvious adults are not bearing eggs at this time of year.

Kamishak and Barren Islands Districts

Crab catches in the Kamishak and Barren Islands Districts were 1,120 pounds of Tanners and 30 pounds of king crabs. No Dungeness crabs were caught. The total catch of all other species and debris was 29,889 pounds from 17 tows (Table 8).

A total of 1,121 male Tanner crabs were caught. Sublegals dominated the catch with 96 percent (1,075) of the males captured. Of the 46 legal males, only 13 (28%) were true recruits. Numbers of true prerecruit ones, twos and three were evenly distributed at 232, 296 and 217 crabs, respectively. Skipmolts made up a significant percentage of the prerecruit ones and twos with 170 (39%) of the ones and 109 (27%) of the twos (Table 9 and Figure 9). The average width of the legal males was 145 mm (5.70 inches). Black mat was found on two very old shell male Tanner crabs.

A total of 364 female Tanner crabs were caught. Of these, 125 were juveniles and 239 were adults. One hundred thirty five (56%) of the adult females were newly mature (Table 10 and Figure 10).

Three male king crabs were captured, all postrecruits (Table 11). No female king crabs were caught.

Tanner Crab Population Estimates

Tanner crab population estimates of catchable males and females were 892,177 and 818,177 crabs, respectively, for the Southern District. Estimates for the Kamishak and Barren Islands District were 4,425,481 males and 1,434,521 females. The estimates of legal male Tanner crabs were 187,172 for the Southern District and 182,514 for the Kamishak/Barren Islands Districts (Table 12). True recruits composed 33 percent of the legal male stock in the Southern District, and 28 percent in the Kamishak and Barren Islands Districts.

King Crab Population Estimates

The population estimate of catchable male king crabs in the Southern District was 6,313 crabs. The estimate of catchable female king crabs was 4,435 animals. (The term 'catchable' is used here because juvenile king crabs may not inhabit trawlable bottom; therefore they are not catchable.)

The Kamishak/Barren Islands Districts' catch yielded a population estimate of 11,903 males.

DISCUSSION

King crab

Compared to historical commercial catch figures, which only reflect the numbers of legal males, the overall population level of king crabs remains severely depressed in both the Southern and Kamishak/Barren Islands Districts. For example, the mean commercial catch prior to the final 1984 closure was 3.44 million pounds per year. Assuming an average weight of 6.5 pounds per crab, the 3.44 million pounds equal approximately 530,000 legal males. This compares to a 1994 total male population estimate of 18,216 crabs, or three percent of the historical mean commercial catch.

In 1994 the department advanced the trawl survey in the Kamishak District from the month of July to the month of June in order to assess the stock prior to suspected migration. If the historical movement of adult king crabs out of the Cook Inlet Management Area into northern Shelikof Strait was still occurring, then the June survey date should have allowed for assessment of these animals prior to the migration. Comparing results of the 1993 and 1994

surveys however makes it appear that at least at the current low level of stock abundance, any difference in survey results between June and July will be negligible: the 1993 male king crab population estimate was 15,742 crabs and the 1994 estimate was 11,903 crabs. The absence of crabs in either month therefore is basically explained by a depressed condition, not crab immigration.

Tanner crab

Southern District

Since 1990 the trawl surveys in the Southern District indicated that the Tanner crab stock was staging a modest recovery from documented lows (Figure 11). Limited commercial fisheries were permitted from 1991 through 1994 (Table 13). The surveys also showed that the improvement would be followed by another downturn in abundance. The reduced recruitment identified by the 1993 and 1994 surveys are representative of this decline. Furthermore the depressed numbers of prerecruit ones, twos and threes show a high probability of a continuing decrease in recruitment for the next three years (Figure 5).

The estimated abundance of crabs in the size group of 70 mm and less remains suspect (Table 12 and Figure 5). The accuracy of the trawl as an assessment tool for these small animals remains unverified because there is an undetermined probability, due to their small size and substrate variation, that the trawl will randomly pass over these crabs. At best the number of these crabs is an indicator of abundance. Even if these animals actually are present in the abundance exhibited by the trawl catches, natural mortality is likely to have a significant impact on their survival and eventual recruitment, which is at least four or five years away.

One indicator of brood stock maintenance is the percentage of egg bearing females. In 1994 the egg bearing percentages of the females remained high. Although there were a few very old shells that were barren, this is a normal condition for senescent females that are approaching the end of their natural life cycle (Table 3).

Kamishak and Barren Islands Districts

The legal segment of the stock in the Kamishak and Barren Islands Districts continues to be depressed. This condition is evidenced by both the data from the Cook Inlet and the Kodiak trawl surveys: Kodiak ADF&G tows south of the latitude of Cape Douglas, and Cook Inlet ADF&G trawls north of Cape Douglas. Based on comparison to past trawl survey data and historical commercial catch, the 183,000 legal animals estimated by the 1994 trawl survey was the second lowest estimate for this group of crabs.

The 917,000 new shell prerecruit ones was the largest estimate of this age class since the inception of the trawl survey. Another 673,000 of the prerecruit one size group (but not age class) were skipmolts. These animals will not likely molt again which means they will never recruit into the fishery. The 1,169,000 crab estimate of new shell prerecruit two males was also the largest estimate of this age class since the beginning of the trawl survey in 1990 (Table 12 and Figure 9). The characteristic skipmolting of the Kamishak stock in the prerecruit one and two size classes however may prevent up to fifty percent of these animals from eventually recruiting into the legal portion of the stock.

Recruitment into the legal segment of the stock as well as the level of skipmolting will be documented by the 1995 trawl survey. If skipmolting prohibits 50 percent of the current prerecruit ones from recruiting in 1995, the remaining 50 percent, or 450,000 crabs, should recruit. This potential recruitment coupled with an

unknown level of survival of the current small legal stock (183,000 crabs) may allow for a harvestable surplus for the 1996 season.

Inspection of the 1994 survey Tanner crab catch data indicates an obvious bias toward the male crabs (Table 9 and 10). Review of historical pot and trawl survey data shows that male catches always substantially exceeded females in the Kamishak survey. The explanation for this phenomenon is likely a combination of two factors: 1) survey emphasis is on male Tanners because the data are more directly related to fishery management; thus when survey time is limited, stations historically exhibiting male catches are selected, and 2) when bad weather causes a loss in fishing time, stations that have not shown significant male catches are eliminated from the survey.

Dungeness crab

The Southern District trawl surveys have recognized a group of Dungeness males as they moved through the successive years beginning in 1989. Although the survey was not designed to assess the Dungeness crab stock, the data seem to agree with the results of the Southern District Dungeness pot survey. The 1994 data indicate a significant reduction in the males that constituted the year class dominating the trawl survey since 1989. The magnitude of this group is declining as both natural mortality due to old age and the harvest from the recreational fishery have become significant (Figure 12).

Table 1. Target species catch in pounds by station in the Southern District, Cook Inlet trawl survey, 1994.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
1	100	34	0	1184	1318
2	26	0	38	708	772
3	19	3	10	1506	1538
4	26	6	0	886	918
5	72	40	2	1070	1184
6	32	10	0	2118	2160
7	72	64	14	2414	2564
8	284	0	22	1010	1316
9	184	0	0	2170	2354
10	34	0	0	2608	2642
11	164	0	0	2430	2594
12	32	0	0	3191	3223
13	280	0	0	1774	2054
14	0	0	0	13000	13000
15	178	4	0	1780	1962
17	0	8	0	2956	2964
18	0	4	0	1858	1862
20	0	2	0	2010	2012
21	0	8	0	2150	2158
71	208	6	12	3042	3268
---------- Southern District totals ----------					
20	1711	189	98	49865	51863

Table 2. Numbers of male Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

	Sublegal males						Legal males					
			Pre-2		Pre-1		Recruit		Postrecruit			
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Total legal	Total males
1	15	11	2	0	5	2	26	0	5	0	31	66
2	31	25	5	0	1	1	1	0	0	0	1	64
3	4	7	10	0	8	0	5	0	0	0	5	34
4	7	28	9	0	1	1	0	1	0	0	1	47
5	47	9	12	0	19	2	8	0	2	0	10	99
6	10	18	14	0	9	0	1	0	0	0	1	52
7	31	32	15	0	9	2	6	1	1	0	8	97
8	71	50	20	0	26	15	13	2	1	1	17	199
9	12	8	4	1	1	12	1	31	0	8	40	78
10	10	6	10	1	6	0	5	0	0	0	5	38
11	32	21	10	2	10	9	7	14	0	2	23	107
12	1	3	2	0	1	1	0	5	0	0	5	13
13	1	1	12	2	6	12	4	36	0	8	48	82
14	0	0	0	0	5	4	0	0	0	0	0	9
15	0	0	5	4	6	21	3	34	0	8	45	81
71	142	61	34	2	19	5	10	5	0	2	17	280
District total	414	280	164	12	132	87	90	129	9	29	257	1346

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 3. Numbers of female Tanner crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

		Mature												
		Full clutches			Partial clutches			Barren			Total mature			Total
Station	Juveniles	New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	females
1	27	0	0	0	0	0	0	0	0	0	0	0	0	27
2	48	0	0	0	0	0	0	0	0	0	0	0	0	48
3	14	0	0	0	0	0	0	0	0	0	0	0	0	14
4	19	0	0	0	0	0	0	0	0	0	0	0	0	19
5	51	0	0	0	0	0	0	0	0	0	0	0	0	51
6	18	1	0	0	0	0	0	0	0	0	1	0	0	19
7	60	0	0	0	0	0	0	0	0	0	0	0	0	60
8	265	25	21	66	0	1	16	0	0	4	25	22	86	398
9	14	20	40	40	0	0	5	0	0	1	20	40	46	120
10	15	2	0	1	0	0	0	0	0	0	2	0	1	18
11	74	44	9	2	0	0	0	0	0	0	44	9	2	129
12	7	4	2	6	0	0	2	0	0	0	4	2	8	21
13	0	14	26	105	0	0	6	0	0	0	14	26	111	151
15	0	1	7	19	0	0	0	0	0	0	1	7	19	27
71	242	16	3	1	0	0	1	0	0	2	16	3	4	265
District total	854	127	108	240	0	1	30	0	0	7	127	109	277	1367

-note- stations not listed had no female Tanner crab catch

Table 4. Numbers of male king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

	Sublegal males						Legal males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
2	3	0	0	0	0	0	0	0	0	1	1	4
3	0	0	0	0	0	0	0	0	0	1	1	1
5	1	0	0	0	0	0	0	0	0	0	0	1
7	0	0	0	0	0	0	0	0	1	1	2	2
8	0	0	0	0	0	0	0	0	0	2	2	2
71	0	0	0	0	0	0	0	0	0	1	1	1
District total	4	0	0	0	0	0	0	0	1	6	7	11

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 5. Numbers of female king crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

		Mature												
		Full clutches			Partial clutches			Barren			Total mature			Total
Station	Juveniles	New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	females
2	6	2	0	0	2	0	0	0	0	0	4	0	0	10
District total	6	2	0	0	2	0	0	0	0	0	4	0	0	10

-note- stations not listed had no female king crab catch

Table 6. Numbers of male Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

	Sublegal males						Legal males					
	Pre-4	Pre-3	Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station			(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
1	0	0	0	0	3	2	5	8	0	0	13	18
3	0	0	0	0	1	0	1	0	0	0	1	2
4	0	0	0	0	1	0	1	2	0	0	3	4
5	0	0	1	0	1	1	0	1	0	0	1	4
6	0	0	0	0	0	0	4	0	0	0	4	4
7	0	0	1	0	1	0	2	1	0	0	3	5
District total	0	0	2	0	7	3	13	12	0	0	25	37

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Dungeness crab catch

Table 7. Numbers of female Dungeness crabs per mile towed by station in the Southern District, Cook Inlet trawl survey, 1994.

		Mature												
		Full clutches			Partial clutches			Barren			Total mature			Total
Station	Juveniles	New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	females
4	0	0	0	0	0	0	0	0	1	0	0	1	0	1
5	0	0	0	0	0	0	0	0	29	1	0	29	1	30
6	0	0	0	0	0	0	0	1	0	0	1	0	0	1
7	0	0	0	0	0	0	0	25	33	1	25	33	1	59
15	0	0	0	0	0	0	0	1	2	0	1	2	0	3
17	0	0	0	0	0	0	0	3	3	0	3	3	0	6
18	0	0	0	0	0	0	0	3	0	0	3	0	0	3
20	0	0	0	0	0	0	0	1	0	0	1	0	0	1
21	0	0	0	0	0	0	0	6	0	0	6	0	0	6
71	0	0	0	0	0	0	0	3	1	0	3	1	0	4
District total	0	0	0	0	0	0	0	43	69	2	43	69	2	114

-note- stations not listed had no female Dungeness crab catch

Table 8. Target species catch in pounds by station in the Kamishak District, Cook Inlet trawl survey, 1994.

Station no.	Tanner	Dungeness	King	Misc. invertebrates, fish & debris	Total catch
28	24	0	0	538	562
32	10	0	0	580	590
33	60	0	0	418	478
37	202	0	16	602	820
38	38	0	0	2692	2730
44	404	0	0	964	1368
45	0	0	0	500	500
47	47	0	14	765	826
51	92	0	0	1508	1600
52	0	0	0	1220	1220
53	114	0	0	1570	1684
56	4	0	0	996	1000
57	30	0	0	1286	1316
58	72	0	0	2780	2852
61	12	0	0	11988	12000
67	9	0	0	942	951
68	2	0	0	540	542
---------- Kamishak District totals ----------					
17	1120	0	30	29889	31039

Table 9. Numbers of male Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1994.

	Sublegal males						Legal males					
			Pre-2		Pre-1		Recruit		Postrecruit		Total	Total
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	legal	males
28	0	1	6	3	9	4	0	0	0	0	0	23
32	1	0	1	1	2	4	0	0	0	0	0	9
33	0	7	11	11	25	5	0	0	0	0	0	59
37	0	20	33	8	27	53	0	15	0	1	16	157
38	0	1	5	1	22	0	2	0	0	0	2	31
44	4	103	186	40	79	40	1	7	0	0	8	460
47	0	6	17	4	17	1	3	0	0	0	3	48
51	0	0	1	11	15	29	2	5	0	0	7	63
53	10	40	3	18	9	16	0	3	0	0	3	99
56	0	0	1	0	1	0	1	0	0	0	1	3
57	0	0	2	6	2	9	0	2	0	0	2	21
58	10	39	26	5	19	7	0	0	0	0	0	106
61	1	0	4	0	3	0	3	0	0	0	3	11
67	16	0	0	0	2	2	1	0	0	0	1	21
68	9	0	0	1	0	0	0	0	0	0	0	10
District total	51	217	296	109	232	170	13	32	0	1	46	1121

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male Tanner crab catch

Table 10. Numbers of female Tanner crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1994.

		Mature												
		Full clutches			Partial clutches			Barren			Total mature			Total
Station	Juveniles	New	Old	VO	New	Old	VO	New	Old	VO	New	Old	VO	females
32	2	0	0	0	0	0	0	0	0	0	0	0	0	2
33	1	0	0	0	0	0	0	0	0	0	0	0	0	1
37	8	6	25	13	0	2	2	0	0	0	6	27	15	56
44	17	51	18	3	0	0	0	0	1	0	51	19	3	90
47	0	1	0	0	0	0	0	0	0	0	1	0	0	1
53	35	60	25	1	0	1	0	0	0	0	60	26	1	122
57	0	0	10	0	0	0	0	0	0	0	0	10	0	10
58	28	17	1	0	0	0	0	0	0	0	17	1	0	46
61	1	0	1	0	0	0	0	0	0	0	0	1	0	2
67	18	0	1	0	0	0	0	0	0	0	0	1	0	19
68	15	0	0	0	0	0	0	0	0	0	0	0	0	15
District total	125	135	81	17	0	3	2	0	1	0	135	85	19	364

-note- stations not listed had no female Tanner crab catch

Table 11. Numbers of male king crabs per mile towed by station in the Kamishak District, Cook Inlet trawl survey, 1994.

	Sublegal males						Legal males					
			Pre-2		Pre-1		Recruit		Postrecruit			
Station	Pre-4	Pre-3	(new)	(old)	(new)	(old)	(new)	(old)	(new)	(old)	Total legal	Total males
37	0	0	0	0	0	0	0	0	0	2	2	2
47	0	0	0	0	0	0	0	0	1	0	1	1
District total	0	0	0	0	0	0	0	0	1	2	3	3

Size groups and classes by species in mm. carapace width (Tanner & Dungeness) or length (king crabs)

	Pre-4	Pre-3	Pre-2	Pre-1	Recruit	Postrecruit
Tanner	<70	70-91	92-114	115-139	140-165	>165
King	<91	91-108	109-126	127-144	145-163	>163
Dungeness	<89	90-114	115-139	140-164	165-189	>189

-note- stations not listed had no male king crab catch

Table 12. Tanner crab population estimates in numbers by sex, size and age classes, 1994 Cook Inlet trawl survey.

Males	Southern District	Kamishak and Barren Is. District
Sublegal		
<70 mm	258,118	200,254
70 – 91 mm	169,986	852,801
91 – 114 mm		
new	114,102	1,168,971
o & vo	8,572	431,425
115 – 139 mm		
new	95,260	916,511
o & vo	58,967	673,005
Legal		
140 – 164 mm		
new	65,675	51,582
o & vo	94,138	126,964
>166 mm		
new	6,726	0
o & vo	20,633	3,968
Total legals	187,172	182,514
Total Males	892,177	4,425,481
FEMALES		
Juveniles	515,136	490,030
Adults	373,041	944,491
Total Females	818,177	1,434,521

Table 13. Tanner crab catch (pounds) by season, Cook Inlet Management Area, 1968–94.

Season	Southern	Vessels	Kamishak/ Barren Is.	Vessels	Outer/ Eastern	Vessels	Central	Vessels	Total catch	Total vessels
1968–69	1,388,282		12,398		816				1,401,496	
1969–70	1,147,154		71,196		104,191				1,322,541	
1970–71	1,046,803		541,212		3,000				1,591,015	
1971–72	2,462,956		974,962		804,765				4,242,683	
1972–73	2,935,662		3,361,023		1,266,023				7,562,708	
1973–74	1,387,535		4,689,251		1,891,021				7,967,807	
1974–75	967,762		2,150,462		656,660				3,774,884	
1975–76	1,339,245		3,281,084	17	850,964				5,471,293	57
1976–77	2,009,633	35	1,765,926	24	824,520				4,600,079	67
1977–78	2,806,568	55	2,077,092	28	502,049				5,385,709	92
1978–79	2,323,420	75	2,713,339	27	694,728				5,731,487	77
1979–80	1,134,940	68	3,338,623	24	595,645				5,069,208	68
1980–81	1,047,630	46	1,757,331	20	463,201				3,268,162	52
1981–82	548,529	41	1,286,332	18	524,897	9			2,359,758	51
1982–83	584,908	48	1,693,794	20	682,919	20			2,961,621	65
1983–84	996,763	45	1,373,674	17	443,384	14			2,813,821	71
1984–85	1,229,298	83	1,535,547	19	259,083	7			3,023,928	86
1985–86	1,164,261	103	1,288,711	24	177,041	5			2,630,013	109
1987	1,077,379	87	1,111,339	21	251,174	13	7,771	2	2,447,663	95
1988	944,763	127	417,182	24	168,969	23	8,396	3	1,539,310	137
1989	CLOSED	--	CLOSED	--	CLOSED	--	CLOSED	--	0	--
1990	CLOSED	--	422,037	7	CLOSED	--	CLOSED	--	422,037	7
1991	271,379	68	266,106	8	CLOSED	--	CLOSED	--	537,485	71
1992	354,868	110	CLOSED	--	53,049	16	CLOSED	--	407,917	121
1993	534,003	136	CLOSED	--	CLOSED	--	CLOSED	--	534,003	136
1994	284,676	110	CLOSED	--	CLOSED	--	CLOSED	--	284,676	110
Average	1,082,064	77	1,509,645	20	433,897	13	8,084	3	2,594,404	83

a/ Since inception of minimum legal size between the 1976–77 season.
Does not include closed seasons.

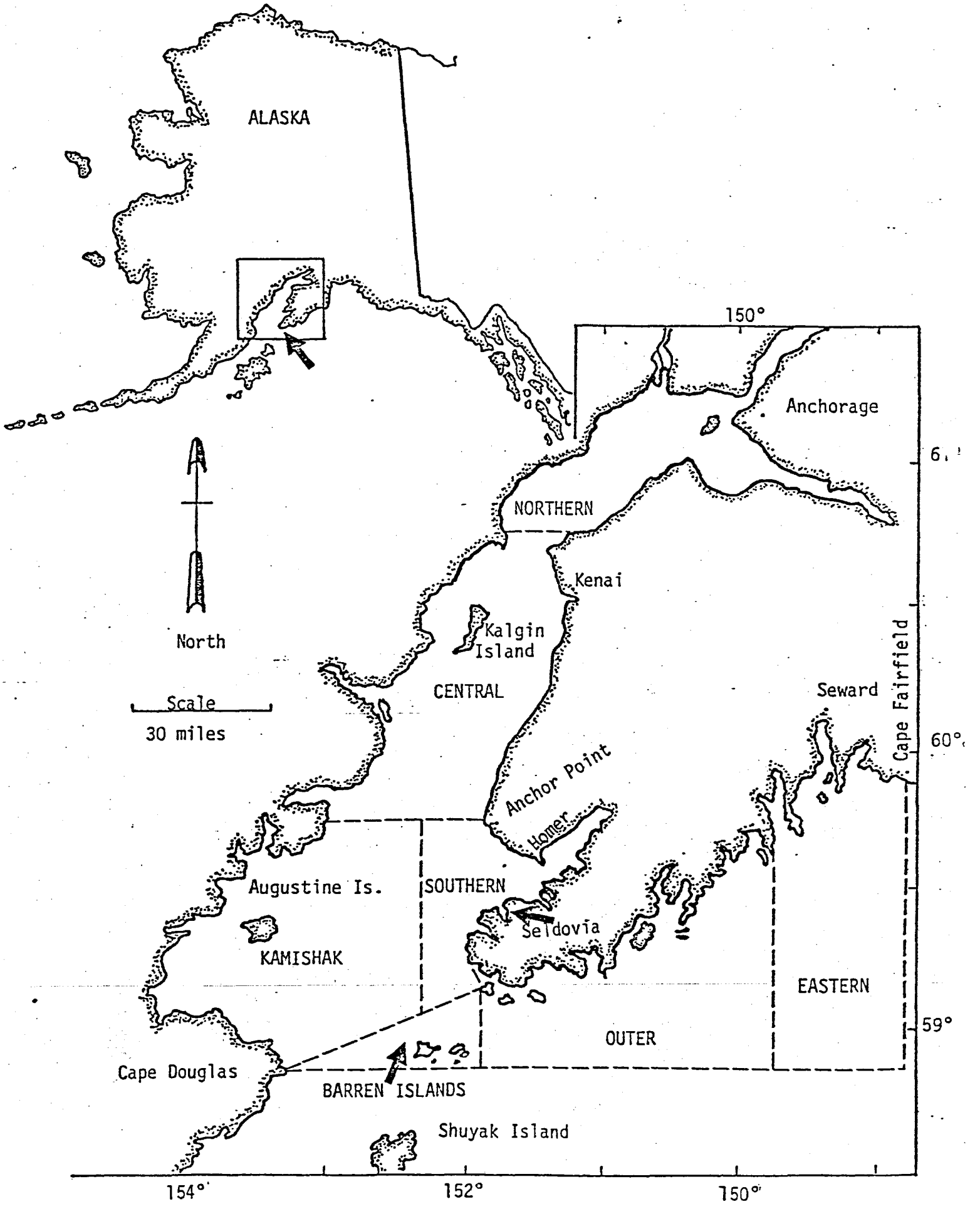

Figure 1 . Cook Inlet area district location chart.

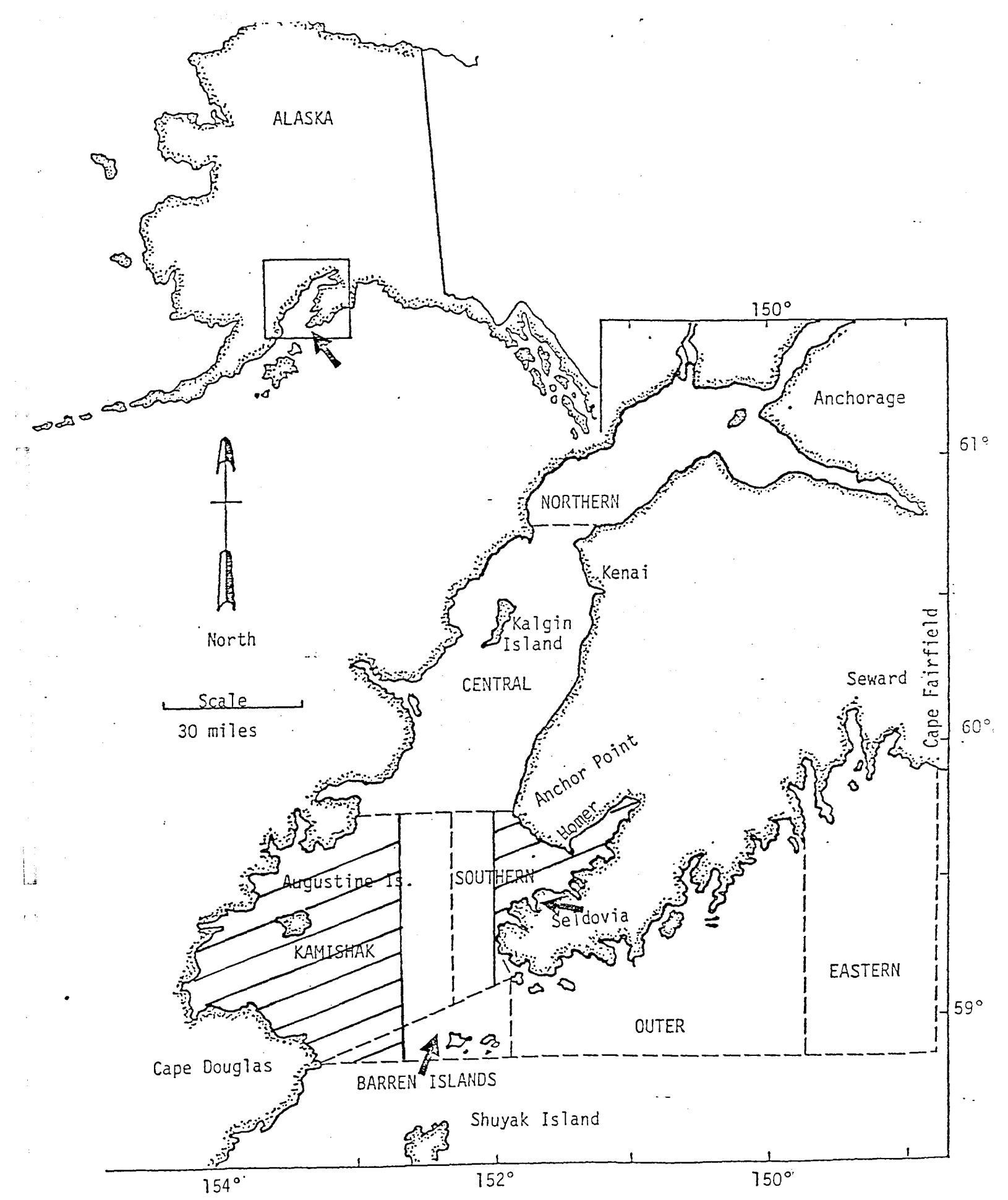

Figure 2. Cook Inlet crab trawl survey locations.

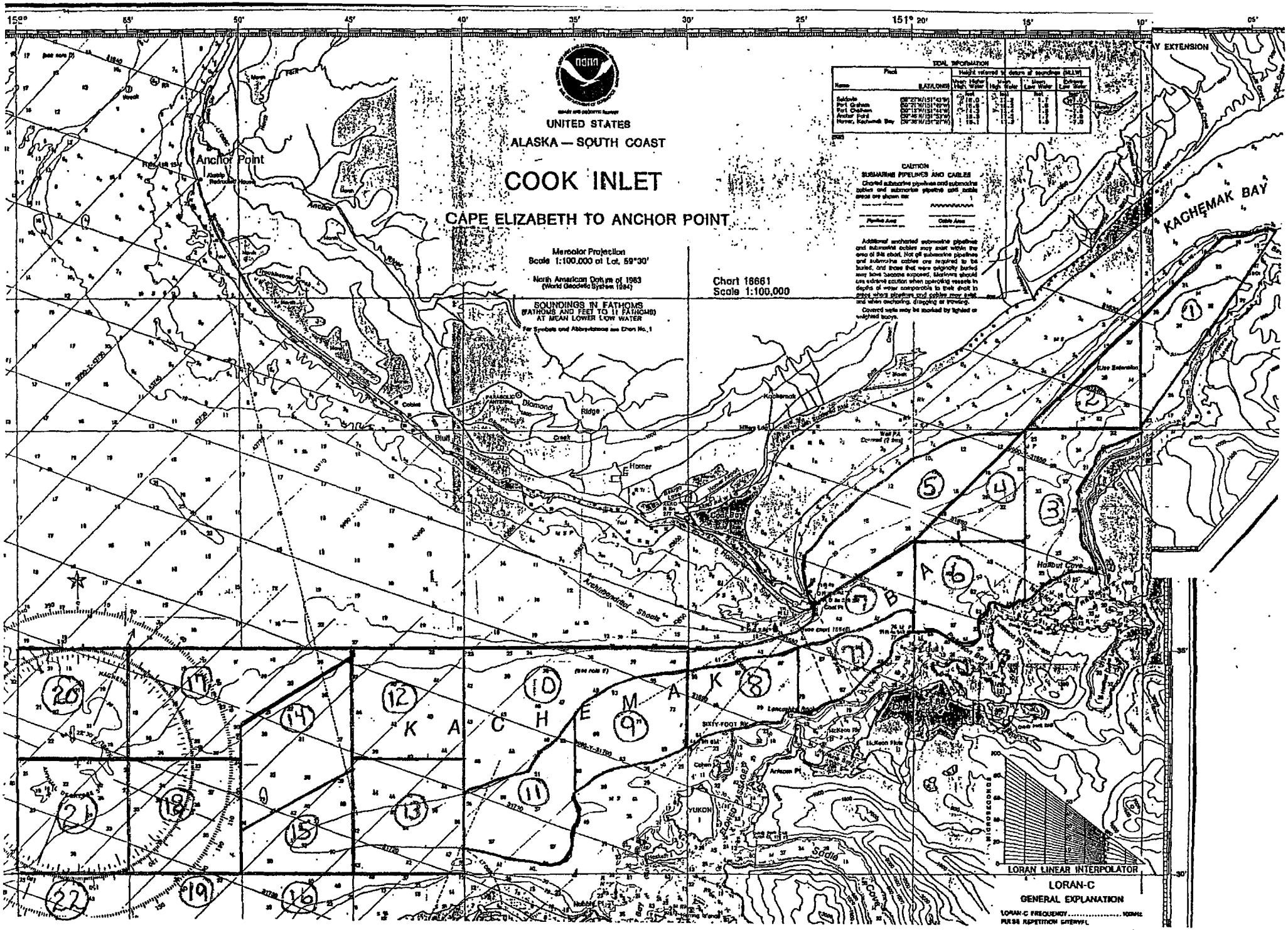

Figure 3. Southern District crab trawl survey stations.

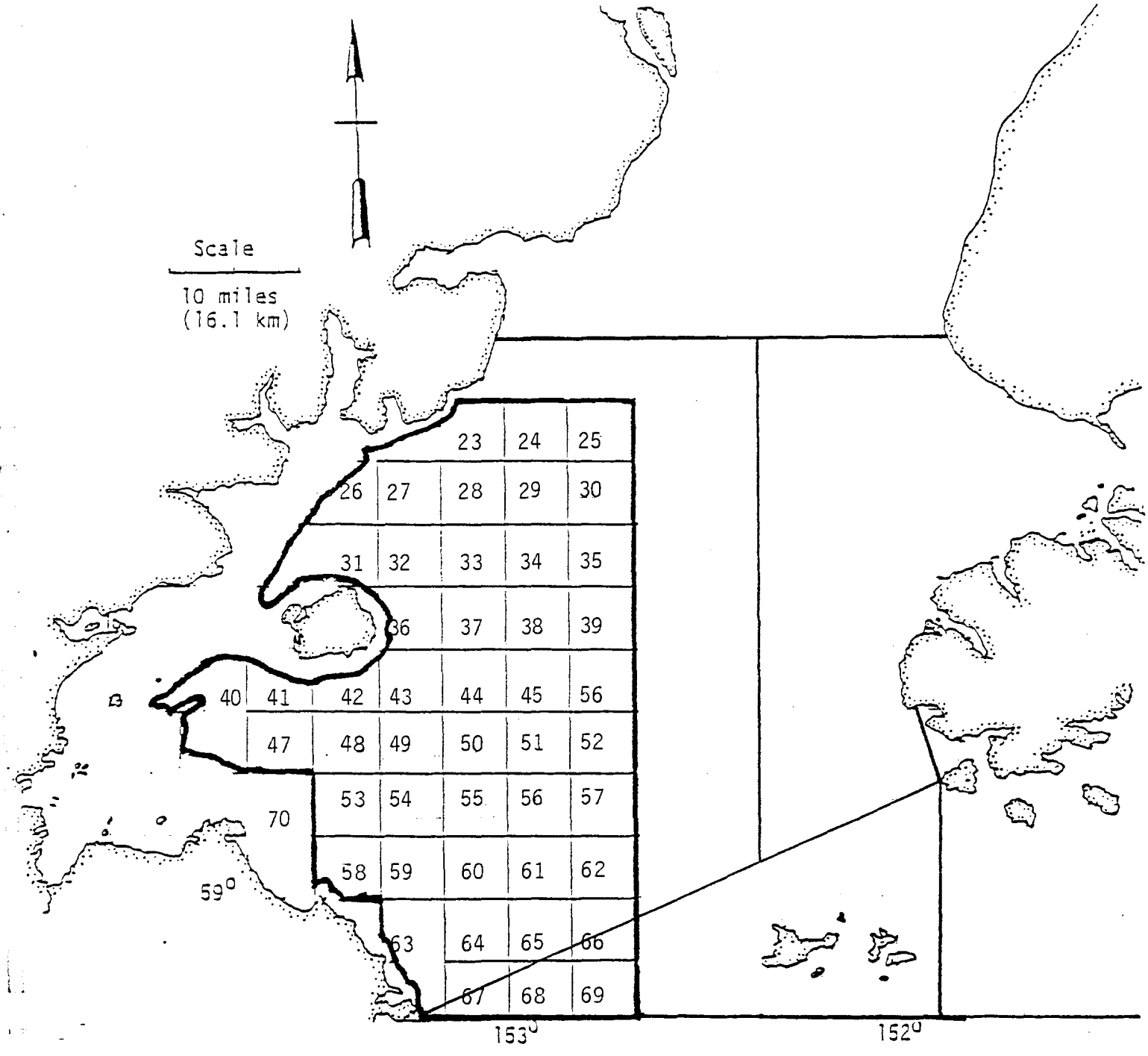

Figure 4. Kamishak and Barren Islands Districts crab trawl survey stations.

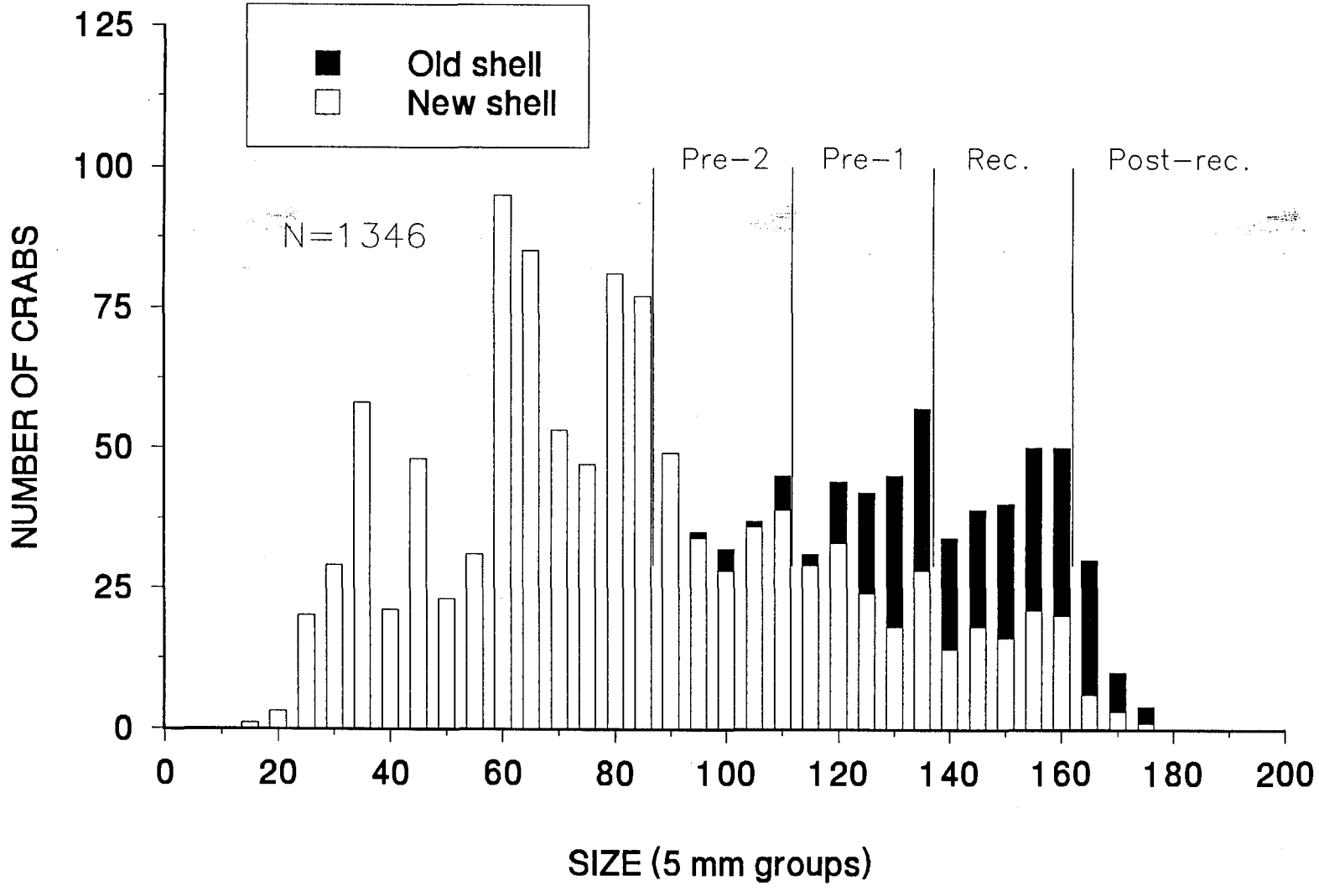

Figure 5. Male Tanner crab catch, Southern Distr., 1994 Cook Inlet trawl survey.

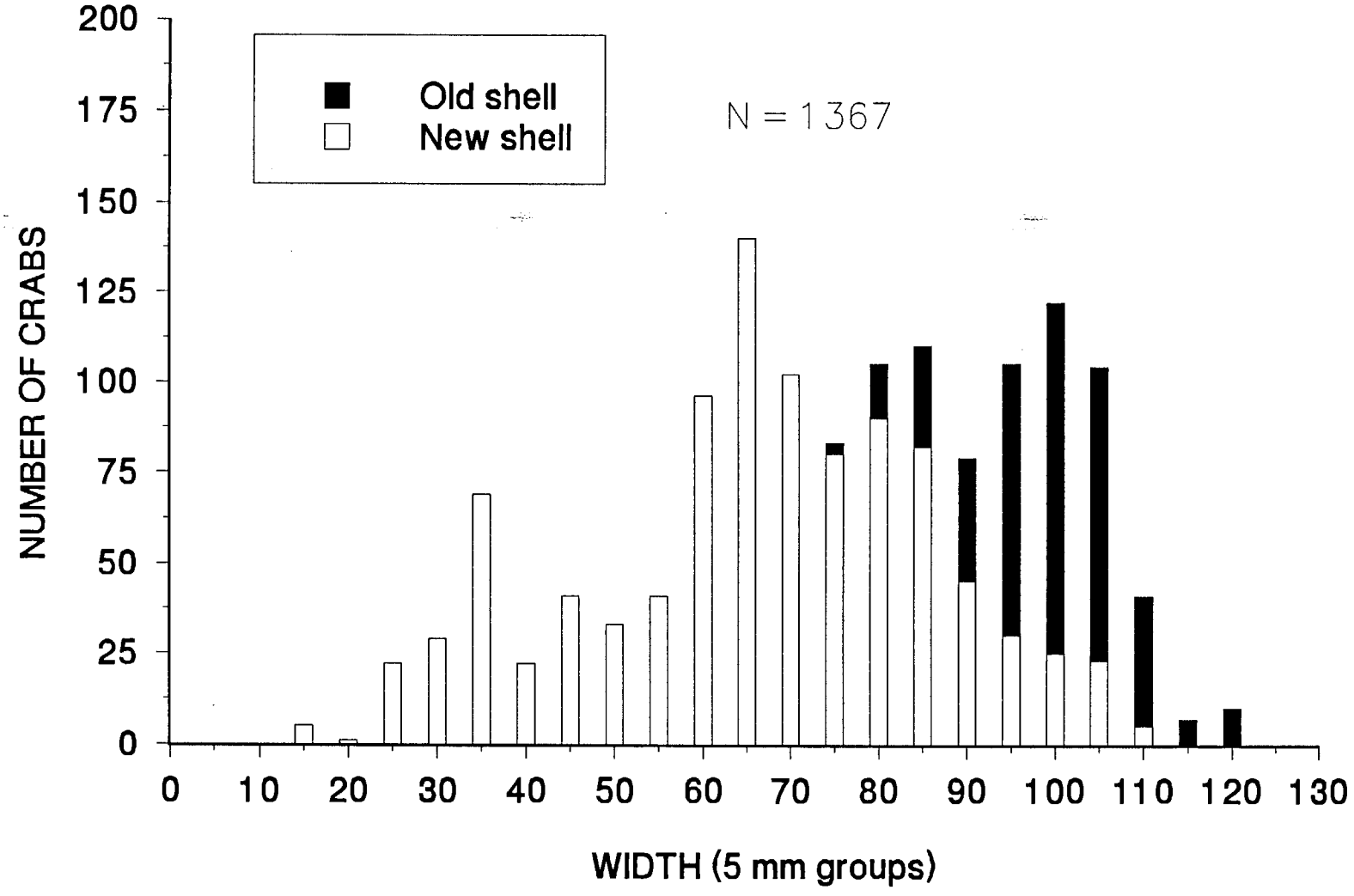

Figure 6. Female Tanner crab catch, Southern Distr., 1994 Cook Inlet trawl survey.

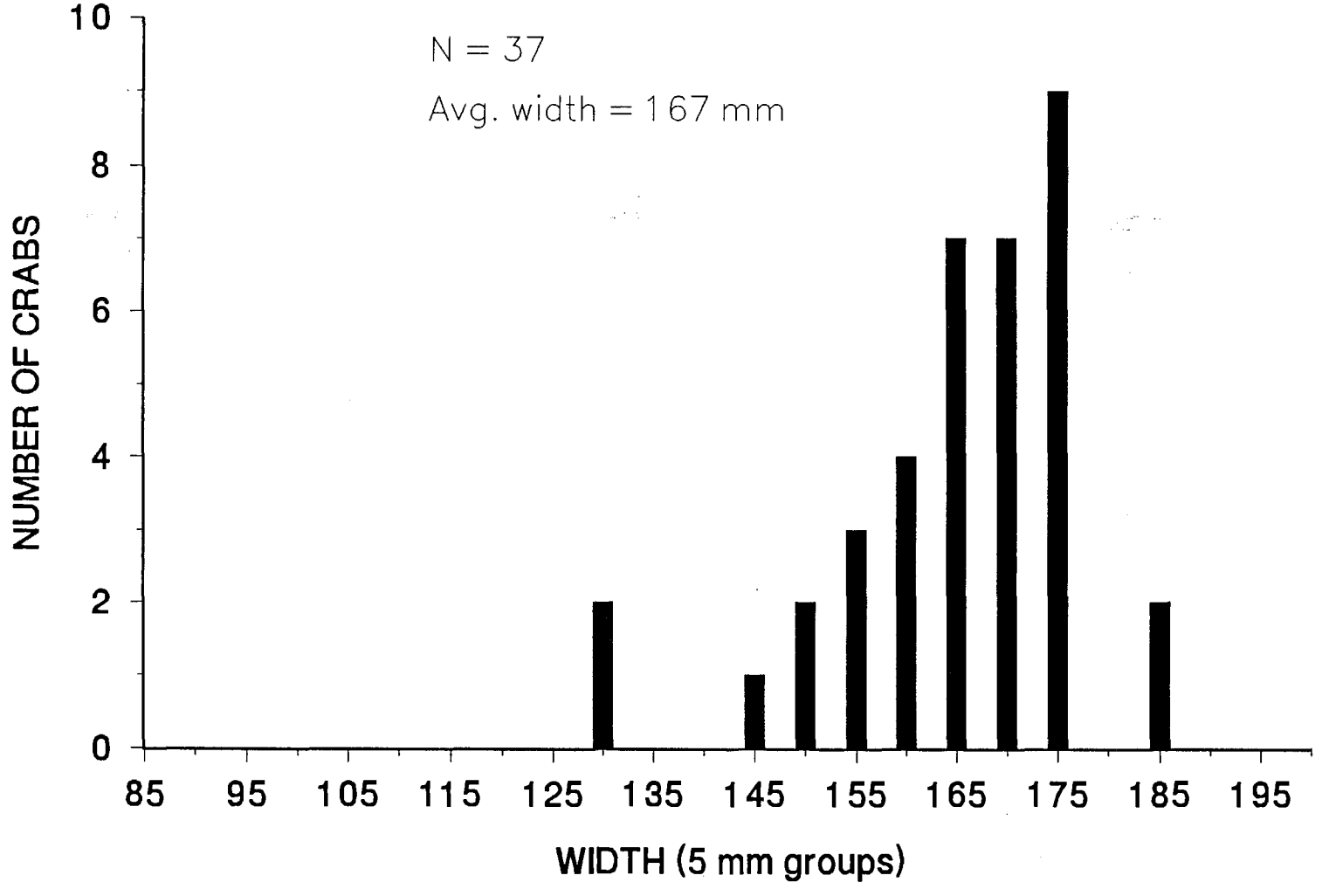

Figure 7. Male Dungeness catch, July, 1994 Southern Distr. crab trawl survey

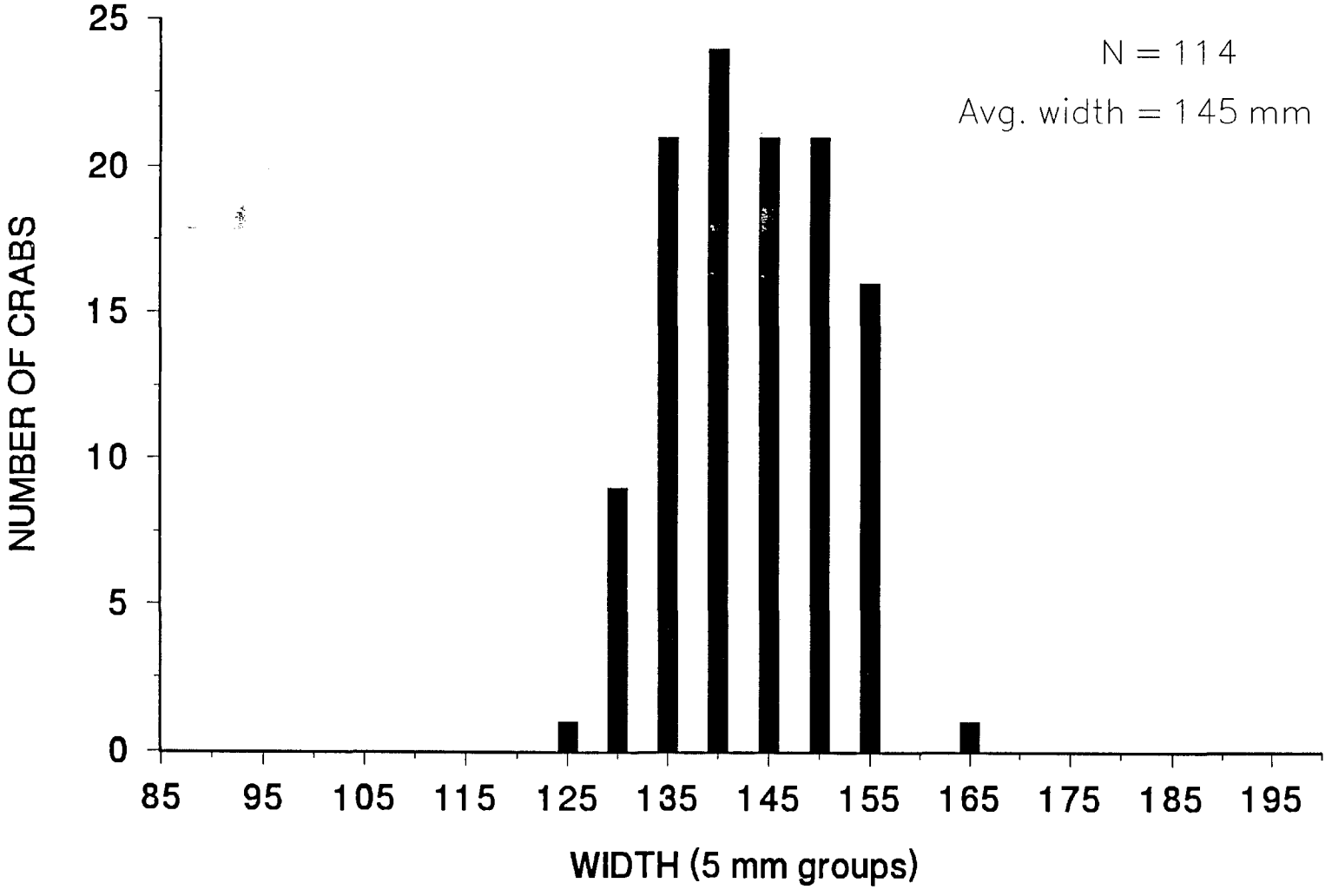

Figure 8. Female Dungeness catch, July, 1994 Southern Distr. crab trawl survey.

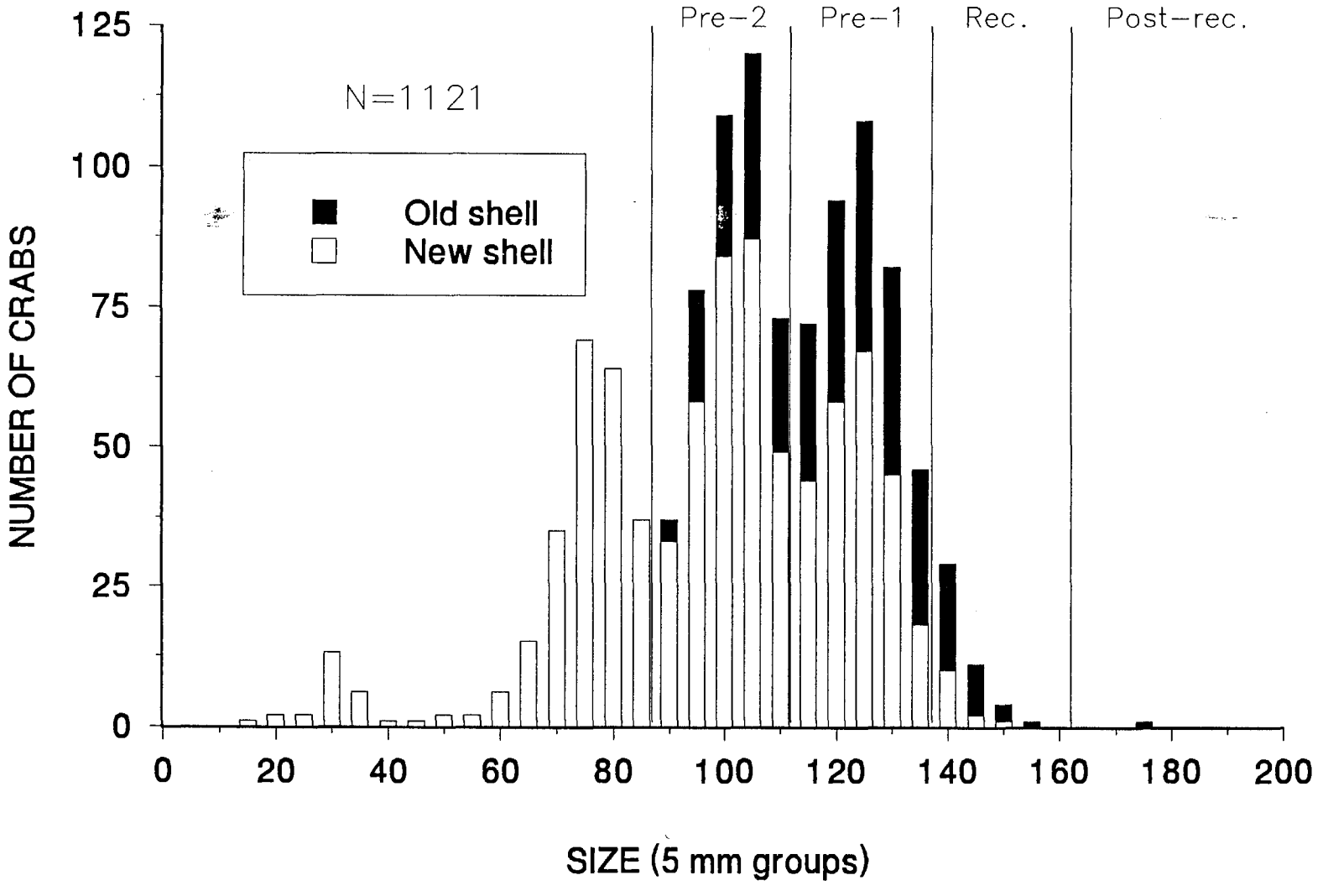

Figure 9. Male Tanner crab catch, Kamishak District, 1994 Cook Inlet trawl survey.

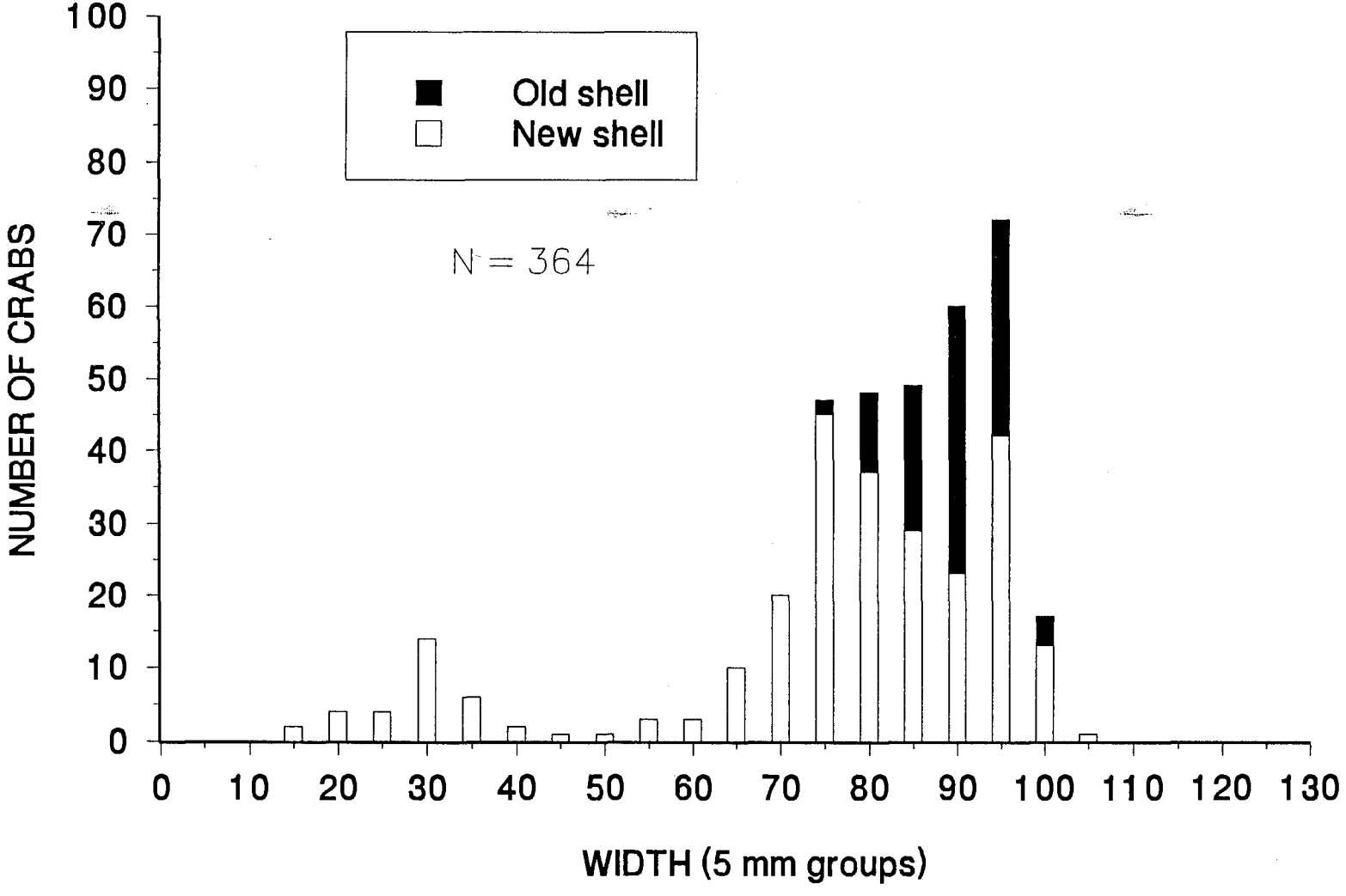

Figure 10. Female Tanner crab catch, Kamishak Distr., 1994 Cook Inlet trawl survey.

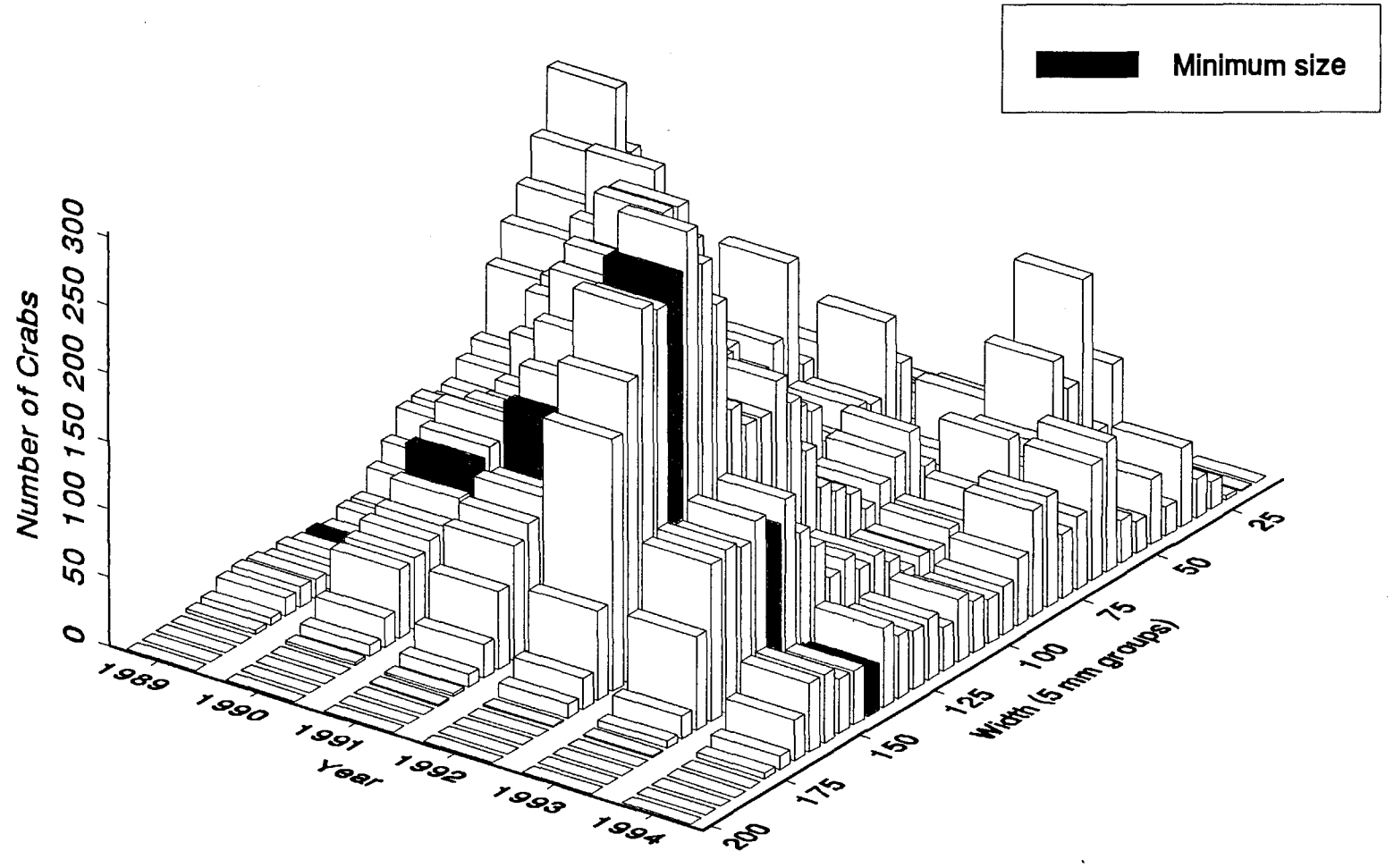

Figure 11. Male Tanner catch, 1989-1994, Southern Distr. trawl surveys.

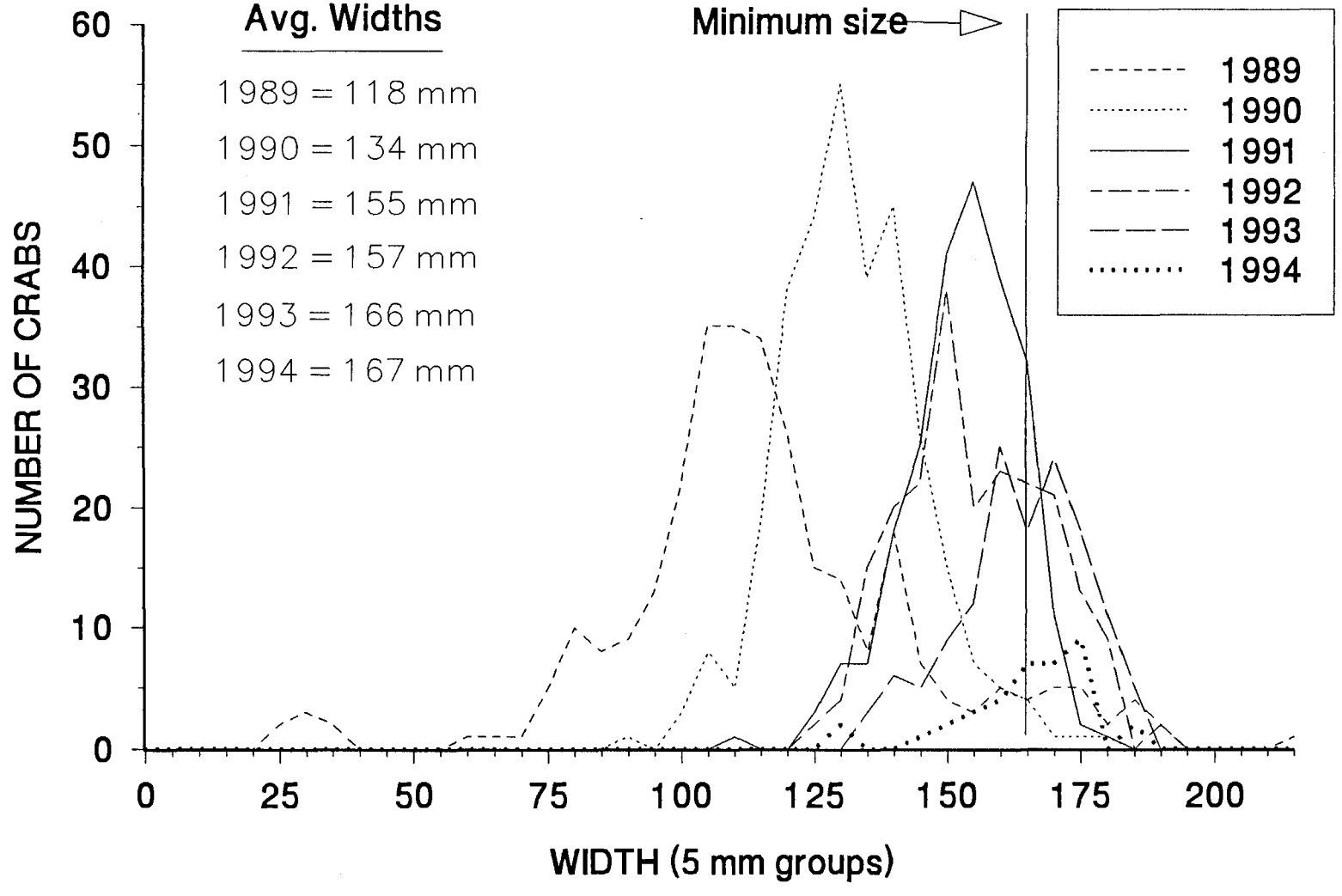

Figure 12. Male Dungeness catch, 1989 - 94, Southern Distr. trawl survey.

Appendix A. Fishing log and catch (lbs.) by station in the Southern District, 1994 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)	Longitude (start)	Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
1	4.98	06/27/94	59 41.27	151 08.97	340	30	1.00	29	37	1318
2	2.92	06/27/94	59 40.01	151 13.03	25	30	1.00	26	26	772
3	5.52	06/27/94	59 39.44	151 15.26	30	26	1.00	30	32	1538
4	3.08	06/28/94	59 37.80	151 18.00	35	30	1.00	32	33	918
5	5.94	06/28/94	59 38.88	151 20.87	40	27	1.00	22	23	1184
6	5.	06/28/94	59 37.21	151 17.70	192	29	1.00	38	39	2160
7	3.93	07/06/94	59 37.14	151 20.38	200	37	1.00	34	35	2564
8	3.57	06/28/94	59 33.69	151 29.57	50	29	1.00	81	87	1316
9	4.59	06/29/94	59 33.22	151 34.00	35	28	1.00	59	60	2354
10	8.52	06/29/94	59 33.43	151 37.79	45	27	1.00	46	46	2642
11	4.63	06/30/94	59 31.82	151 37.76	45	27	1.00	54	56	2594
12	6.25	07/05/94	59 32.73	151 43.38	50	26	1.00	41	45	3223
13	6.25	07/05/94	59 31.43	151 42.68	65	28	1.00	57	57	2054
14	6.64	07/05/94	59 34.41	151 45.08	200	28	1.00	33	39	13000
15	3.68	07/05/94	59 31.69	151 46.15	210	30	1.00	40	43	1962
17	8.94	07/06/94	59 32.92	151 52.87	40	26	1.00	24	27	2964
18	6.25	07/06/94	59 32.08	151 50.11	200	29	1.00	35	37	1862
20	6.25	07/06/94	59 33.76	151 56.17	195	26	1.00	21	21	2012
21	6.25	07/06/94	59 31.69	151 55.06	195	30	1.00	32	33	2158
71	3.42	06/28/94	59 35.18	151 22.86	38	26	1.00	52	76	3268

Number of stations: 20
Total area (sqnm): 106.61
Total catch (lbs): 51863

Appendix B. Fishing log and catch (lbs.) by station in the Kamishak District, 1994 Cook Inlet trawl survey.

Station	Area (sqnm)	Date	Latitude (start)	Longitude (start)	Heading (degrees)	Time (min)	Length (nm)	Depth (min)	Depth (max)	Catch (lbs)
28	26.12	06/17/94	59 31.73	153 07.45	105	24	1.00	19	20	562
32	26.12	06/17/94	59 28.67	153 14.64	105	24	1.00	18	18	590
33	26.12	06/17/94	59 26.77	153 04.37	265	25	1.00	22	23	478
37	26.12	06/17/94	59 22.34	153 04.68	90	26	1.00	26	27	820
38	26.12	06/17/94	59 22.61	152 56.42	265	25	1.00	29	31	2730
44	26.12	06/19/94	59 17.39	153 07.71	115	30	1.00	31	33	1368
45	26.12	06/20/94	59 17.30	152 56.50	155	27	1.00	41	47	500
47	26.12	06/19/94	59 12.27	153 36.03	290	27	1.00	18	18	826
51	26.12	06/20/94	59 13.02	152 56.65	110	28	1.00	55	63	1600
52	26.12	06/13/94	59 12.19	152 45.49	112	15	0.54	67	70	1220
53	26.12	06/19/94	59 09.31	153 23.66	120	26	1.00	24	25	1684
56	26.12	06/20/94	59 09.15	152 57.28	110	30	1.00	69	74	1000
57	26.12	06/13/94	59 07.88	152 48.57	110	30	1.00	79	79	1316
58	24.74	06/15/94	59 03.91	153 25.38	110	24	1.00	27	30	2852
61	26.12	06/14/94	59 02.80	152 54.45	220	27	1.00	82	82	12000
67	26.12	06/14/94	58 51.86	153 03.54	300	26	1.00	89	89	951
68	26.12	06/14/94	58 52.19	152 54.50	305	29	1.00	88	90	542

Number of stations: 17
Total area (sqnm): 442.66
Total catch (lbs): 31039

Appendix C. Data logger temperature recordings from the 1992-94 Cook Inlet crab trawl surveys.

Date	Station	Temp. (°C)	Depth (fm)
KAMISHAK DISTRICT			
7/19/92	61	6.7	82
7/20/92	67	6.3	90
7/21/92	53	9.3	24
6/28/93	53	8.2	22
6/29/93	31	10.2	12
6/30/93	67	5.5	92
7/1/93	54	8.8	23
7/3/93	44	8.0	26
6/14/94	67	5.9	89
6/17/94	38	6.8	29
6/19/94	47	7.4	18
6/20/94	51	7.1	55
SOUTHERN DISTRICT			
7/15/92	4	7.5	32
7/16/92	7	7.5	37
7/17/92	10	7.8	47
7/18/92	11	7.9	55
7/6/93	5	6.9	16
7/7/93	4	6.7	34
7/8/93	8	6.6	67
7/12/93	7	7.1	39
7/13/93	18	8.4	36
7/14/93	15	7.6	41
6/27/94	3	6.3	30
6/28/94	5	6.4	22
6/28/94	8	6.0	81
6/30/94	11	6.5	54
7/5/94	13	6.5	57
7/6/94	18	7.4	35

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